of one ring of teeth, in many of two rings, and in one foreign genus (Dawsonia) there are as many as four circles of teeth.

The object served by this complicated structure is not, perhaps, very certain, but it seems to be intended to secure the retention or exclusion of the spores from the spore sac in such conditions of the atmosphere as will best conduce to their germination. In the gymnostomous mosses (*i.e.* those without peristome) it is observed that the spores sometimes germinate within the capsule, an event which is probably adverse to the prospects of the race. The following table will illustrate in a few cases selected as illustrations the different behaviour of the teeth of the peristome under different hygrometric conditions, and suggests what is the probable advantage in each case:—

TABLE D.

Genus.	Condition of teeth		Reason suggested.
	in dry weather.	in wet weather.	
Bartramia	Erect	Convergent	That spores require *dry* weather when first emitted
Orthotrichum	Erect or reflexed	Ditto	Ditto
Funaria	Reflexed	Ditto	Ditto
Bryum	Convergent	Expanded	That spores require *wet* weather when first emitted
Fissideus	Ditto	Ditto	Ditto

The motion of the teeth of the peristome appears to be due to the action of a ring of specialized cells which surrounds the mouth of the capsule at the base of the teeth; and the opposite ways in which these cells act in the same condition of moisture in different genera, is a remarkable circumstance.

To anyone who studies the subject, the immense variety as well as beauty of the peristomes of mosses becomes very impressive. If the sole end be the protection and extrusion of the spores in the proper weather respectively, why is there this infinite wealth and variety of form and of colour? The question can be asked, but hardly can be answered, and the mind of the beholder is left, as it so often is, when contemplating the richness of Nature, in a state of admiration and wonder and ignorance. "Rerum natura tota est nusquam magis quam in minimis."

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The regulations for the new Isaac Newton Studentships for study and research in astronomy and Physical Optics are published in the *University Reporter* for February 17, 1891. Mr. Frank McClean, the generous founder, has increased his benefaction to £12,500.

The Museums and Lecture Rooms Syndicate report that a sum of £1450 will be required for the fittings of the new buildings in the Departments of Human Anatomy and Physiology.

The following have been nominated as electors to the Professorships indicated:—Chemistry, Sir H. E. Roscoe; Plumian, Dr. Cayley; Anatomy, Prof. Liveing; Botany, Dr. Vines; Geology, Dr. Bonney; Jacksonian of Natural Philosophy, Prof. Ewing; Mineralogy, Dr. Bonney; Zoology and Comparative Anatomy, Sir G. M. Humphry; Cavendish of Physics, Prof. Liveing; Mechanism, Dr. Besant: Downing of Medicine, Sir G. M. Humphry; Physiology, Sir G. E. Paget; Pathology, Sir G. E. Paget; Surgery, Sir G. E. Paget.

Prof. A. G. Greenhill, F.R.S., and Dr. Routh, F.R.S., are nominated as adjudicators of the Adams Prize to be awarded in 1893.

Mr. Hickson, the newly-appointed Lecturer in Invertebrate Morphology, announces a course on *Cœlenterata* to be given during the remainder of the current term.

SCIENTIFIC SERIALS.

THE *American Meteorological Journal* for January contains:—A report upon the features of tornadoes, and their distinction from other storms, considered in connection with the tornado of Lawrence, Mass., July 26, 1890, by Prof. W. M. Davis. He quotes a description of a tornado observed as early as 1687 at Hatfield, in this country, in which the writer (the Rev. A. de la Pryme) minutely describes the whirling motion of the funnel.—The meteorological observatory recently established on Mont Blanc, by A. L. Rotch. This is a reproduction of a paper read before Section A of the British Association last year, and contains a description of a meteorological observatory being erected by M. Vallot at the Rocher des Bosses, at an altitude of about 14,320 feet above sea-level.—The Gervais Lake tornado, by P. F. Lyons. It occurred on July 13, 1890, and did immense damage to buildings and crops, over an area of scarcely more than half a mile in length. The editors of the *Journal* have added what purports to be a photograph of the funnel, taken by an amateur photographer, who happened at the time to be occupied in taking views, about six miles off.—Rainfall in Michigan, by N. B. Conger, with a chart showing the annual fall in that State. This paper closes a series of monthly summaries by the same author.—Prof. H. A. Hazen concludes his account of observations on Mount Washington; and M. H. Faye concludes his articles on cyclones, tornadoes, and waterspouts, which were begun in the number for November 1889, and probably form the most complete exposition of his theory which has yet been printed. The editors of the *Journal* invite the criticism of English-speaking meteorologists.

THE *Journal of Botany* has been recently distinguished for the unusual interest of its biographical notices of recently deceased botanists, or those interested in botanical pursuits. In the numbers for November and December 1890, we find such records of the late Miss Marianne North, whose beautiful flower-paintings are so familiar to visitors at Kew, and of the late Mr. James Backhouse, of York. The other papers in these numbers and in that for January 1891 are mostly either descriptive, or relate to the habitats of rare plants. Mr. John Roy gives a list of freshwater Algæ from Enbridge Lake and its vicinity in Hampshire; Mr. E. G. Baker continues his synopsis of genera and species of Malveæ; Mr. G. Massee describes and figures a remarkable new genus of Hymenomycetous Fungi from Madagascar, *Mycodendron*.

THE two most important papers in the *Botanical Gazette* for January are a continuation of Mr. J. Donnell Smith's "Undescribed Plants from Guatemala," which include a new species of *Cephaelis*, and one by Mr. R. Thaxter on "Certain new or peculiar North American Hyphomycetes," in which a new genus of Fungi, *Sigmoideomyces*, is described, allied to *Oedocephalum*.

THE number of the *Nuovo Giornale Botanico Italiano* for January is chiefly occupied by papers read at the Verona annual meeting of the Italian Botanical Society. Neither these, nor the independent papers printed in this number, present any features of special interest to the general botanist.

WE have received the numbers for October, November, and December 1890 of the *Botanical Magazine* of Tokio, which give satisfactory evidence of the cultivation of botanical science in the Empire of Japan. The *Magazine* is published monthly, under the auspices of the Tokio Botanical Society, and is printed on rice paper. By far the greater number of the contributions are in Japanese, while others are in what we take to be Japanese printed in English characters. Those in English are chiefly by Prof. R. Yatabe, the President of the Tokio Botanical Society, and include descriptions of several new Japanese species, and of a new genus, *Kirengeshoma*, belonging to the Saxifragaceæ. The illustrations to a paper (in English) by Mr. N. Tanaka, on two new species of Japanese edible fungi, are particularly good.

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, January 20.—Mr. W. T. Blanford, F.R.S., in the chair.—Mr. Sclater exhibited specimens of three species of Purple Waterhens (*Porphyrio poliocephalus*, *P. cæruleus*, and *P. smaragdonotus*), of the Eastern Palæarctic Region, and made remarks on their nomenclature and geographical distribution.—Mr. F. E. Beddard described a new African Earthworm of the genus *Siphonogaster* from specimens transmitted by Sir A. Molony, from the Yoruba country to the north of Lagos, and proposed to call it *Siphonogaster millsoni*.—Mr. Oswald H. Latter read some notes on the Fresh-water Mussels of the genera *Anodon* and *Unio*, describing the passage of the ova from the ovary to the external gills, the mode of attachment of the *glochidiæ* to the parent's gill-plate, and some other peculiarities.—A communication was read from Mr. Roland Trimen, F.R.S., containing an account of a series of Butterflies collected in Tropical South-Western Africa by Mr. A. W. Eriksson. The collection contained examples of 125 species, of which 11 appeared to be new to science.—A communication was read from Mr. H. H. Brindley, containing an account of a specimen of the White Bream (*Abramis blicca*), in which the pelvic fins were entirely absent.—Mr. Boulenger read notes on the osteology of the poisonous Lizards *Heloderma horridum* and *H. suspectum*, pointing out the differences between the two species. He also remarked on the systematic position of the *Helodermatidæ*, which he held to be between the *Anguidæ* and the *Varanidæ*, but nearer the former; any close relationship with the *Mosasauridæ* was demurred to. It was incidentally mentioned that the Eocene genus *Thinosaurus*, Marsh, was probably a member of the family *Teiidæ*, and that the Cretaceous *Hydrosaurus lesinensis* was a *Dolichosaurus*. The Dolichosauria were considered as the probable common ancestors of the Lacertilia, Pythonomorpha, and Ophidia.—Prof. C. Stewart gave an account of some points in the anatomy of *Heloderma horridum* and *H. suspectum*, differing in some respects from the descriptions of these lizards given previously by Drs. Fischer and Shufeldt. The most interesting and important point was concerning the poison-apparatus. He believed that he had shown that in both species the ducts of the gland did not enter the lower jaw, but passed directly to openings situated under a fold of mucous membrane between the lip and the jaw. He thought that the structures previously described as ducts were only the branches of the inferior dental nerve- and blood-vessels.

Geological Society, February 4.—Dr. A. Geikie, F.R.S., President, in the chair.—The following communications were read:—The geology of Barbados and the West Indies; Part 1, the coral rocks, by A. J. Jukes-Brown and Prof. J. B. Harrison. The authors first discuss the reef growing round Barbados, and describe a submarine reef, the origin of which is considered; and it is pointed out that there is no sign of any subsidence having taken place, but every sign of very recent elevation. They then describe the raised reefs of the island, extending to a height of nearly 1100 feet above sea-level in a series of terraces. The thickness of the coral rock in these is seldom above 200 feet, and the rock does not always consist of coral *débris*. At the base of the reefs there is generally a certain thickness of detrital rock in which perfect reef-corals never occur. The collections of fossils made by the authors have been examined by Messrs. E. A. Smith and J. W. Gregory. Of the corals, 5 out of 10 species identified still live in the Caribbean Sea, and 1 is closely allied to a known species, whilst the other 4 are only known from Prof. Duncan's descriptions of fossil Antiguan corals. The authors are of opinion that the whole of the terraces of Barbados, the so-called "marl" of Antigua, and the fossiliferous rocks of Barbuda are of Pleistocene age. They proceed to notice the formations in other West Indian Islands which appear to be raised reefs comparable with those of Barbados, and show that these reefs occur through the whole length of the Antillean Chain, and indicate a recent elevation of at least 1300 feet, and in all probability of nearly 2000 feet. It appears improbable that each island was a region of separate uplift, and as a plateau of recent marine limestone also occurs in Yucatan, this carries the region of elevation into Central America; and it is reported that there are raised reefs in Colombia. The authors conclude that there has been contemporaneous elevation of the whole Andean Chain from Cape Horn to Tehuantepec, and of the Antillean Chain from Cuba to Barbados. Before this there must have been free communication between the Atlantic and Pacific Oceans, which is confirmed by the large number of Pacific forms in the Caribbean Sea. Under such geographical conditions the great equatorial current would pass into the Pacific, and there would be no Gulf Stream in the North Atlantic. The reading of this paper was followed by a discussion, in which the Rev. E. Hill, Mr. Attwood, Mr. Gregory, Mr. W. Hill, Mr. Easton, Dr. Blanford, and the President took part. The President remarked that the details supplied in the paper formed an important addition to the literature of the coral-reef question, showing as they did clear evidence of the elevation of old coral-reefs. He thought the speculations appended by the authors as to the changes in the level of the South American continent and Central America somewhat out of place, and hardly warranted by any of the observations recorded in the paper. No trifling submergence of the Isthmus of Panama would serve to divert the great equatorial current into the Pacific Ocean. Unless the downward movement had been more serious than the authors seemed to suppose, the bulk of the current would still sweep round into the Gulf of Mexico, only the upper waters passing into the Western Ocean.—The shap granite, and the associated igneous and metamorphic rocks, by Alfred Harker and J. E. Marr.

Entomological Society, February 4.—Mr. Frederick DuCane Godman, F.R.S., President, in the chair.—The President nominated the Rt. Hon. Lord Walsingham, F.R.S., Prof. R. Meldola, F.R.S., and Dr. D. Sharp, F.R.S., Vice-Presidents for the session 1891-92.—Mr. C. J. Gahan called attention to a small larva which he had exhibited at the meeting of the Society on October 1 last, when some doubt was expressed as to its affinities. He said that Prof. Riley had since expressed an opinion that the larva was that of a dipterous insect of the family *Blepharoceridæ*, and might probably be referred to *Hammatorrhina bella*, Löw, a species from Ceylon.—Mr. Tutt exhibited a long series of *Agrotis pyrophila*, taken last year by Mr. Reid, near Pitcaple, in Aberdeenshire, and he remarked that this species had been commoner than usual last year both in Scotland, the Isle of Portland, and the Isle of Man. He also exhibited long and variable series of *Melitæa aurinia* (*artemis*), *Triphæna orbona*, *Abraxas grossulariata*, and *Melanippe fluctuata*, all from the same locality in Aberdeenshire.—The Rev. Canon Fowler exhibited a cocoon of *Deiopeia pulchella*, recently received by him from Lower Burmah.—Mr. C. O. Waterhouse exhibited specimens of *Scyphophorus interstitialis*, a Mexican species, and *Aceraius comptoni*, a Ceylon species, recently taken by Mr. Bowring in his greenhouse. He also exhibited, on behalf of Miss Emily Sharpe, a specimen of *Daphnis hypothous*, Cramer, a native of Borneo, Java, and Ceylon, caught some years ago at Crieff, N.B. The specimen had long been confused with *Chærocampa nerii*, under which name its capture was recorded in the *Entomologist*, xiii. p. 162 (1880).—The Rev. Dr. Walker exhibited many species of Orthoptera and Scorpions recently received from Jerusalem.—Mr. Frederick Enock read an interesting paper entitled "The Life-History of the Hessian Fly." This paper was illustrated, by means of the oxy-hydrogen lantern, with a number of photographs of original drawings showing the fly in all its stages and transformations. Mr. G. H. Verrall said he believed the Hessian Fly was no more a recent introduction into this country than the Cabbage White Butterflies.—Mr. Roland Trimen, F.R.S., communicated a paper entitled "On some Recent Additions to the List of South African Butterflies."—Mr. Henry W. Bates, F.R.S., communicated a paper entitled "Additions to the Carabideous Fauna of Mexico, with remarks on species previously recorded."—Mr. W. F. Kirby read a paper entitled "Notes on the genus *Xanthospilopteryx*, Wallgr."—Dr. D. Sharp, F.R.S., contributed a paper entitled "On the Rhynchophorous Coleoptera of Japan," Part 2.

Linnean Society, February 5.—Prof. Stewart, President, in the chair.—Mr. Clement Reid exhibited and described some recent additions to the fossil Arctic flora of Britain.—Mr. Thomas Christy exhibited and made remarks on some specimens of honey: (1) "Arbutus honey," from Turkey, said to produce great drowsiness and sleep; (2) "Eucalyptus honey," from Mount Barker, Adelaide, said to possess valuable therapeutic properties; and (3) so-called "wool honey," from the Euphrates, collected by natives from the leaves of the oak, which would be more properly termed "honey-dew," being formed by Aphides, and not by bees.—Mr. J. E. Harting exhibited a living albino example of the Common Frog (*Rana temporaria*), captured in Wiltshire in September last, and remarked upon the infrequency of albinism amongst the Batrachia and Reptilia, of which he had only been able to find four or five recorded instances.—On behalf of Mr. Gammie, of Sikim, Mr. C. B. Clarke gave an abstract of an interesting paper on the tree ferns of Sikim, in which several moot points were discussed and difficulties cleared up.—The next paper was one by Prof. W. A. Herdman, on a revised classification of the *Tunicata*. Taking as a basis the scheme of classification adopted in his Report on the *Challenger* collection, he incorporated the various known genera and species not represented in this collection, and discussed the general principles to be recognized in classifying the *Tunicata*, especially dwelling on the value of the various modifications of the branchial sac, and of the tentacles. The polyphyletic origin of the group *Ascidiæ Compositæ* was pointed out, and the relations between Simple and Compound Ascidians were shown by means of a phylogenetic diagram.—A paper was then read by Prof. G. B. Howes, in which he gave a description of the genitalia of six hermaphroditic codfish examined by him, and a *résumé* of what is known on the general subject of hermaphroditism amongst fishes, more particularly referring to the *Teleostei*, which exhibited the most nearly primitive condition of the genital gland realized by living Vertebrata. He regarded the genital duct of the *Teleostei* as homologous in both sexes, representing a primitively hermaphrodite duct of the ancestral Chordata. He sought to homologize it with the proliferating mass described by Balfour and Sedgwick, Fürbringer and others, as entering into the formation of the base of the Müllerian duct proper, and regarded it as having been replaced by that structure on the advent of unisexuality. Several other points were touched upon of special interest to physiologists, and which want of space alone prevents being noticed.

Mathematical Society, February 12.—Prof. Greenhill, F.R.S., President, in the chair.—The Chairman informed the members present of the loss the Society had sustained by the recent death of Dr. Casey, F.R.S., and called upon Mr. Tucker to read a short obituary notice which had been drawn up by an intimate friend of the deceased. Dr. Larmor added a few sympathetic remarks.—Mr. Tucker communicated two notes on isoscelians, and Mr. Heppel read a paper on quartic equations interpreted by the parabola.—The Chairman read a note from Mr. W. E. Heal, of Indiana (communicated by Prof. Cayley, F.R.S.), on the equation of the bitangential of the quintic.—Mr. Tucker read an abstract of a paper by Mr. J. Buchanan, on the oscillations of a spheroid in a viscous liquid.

CAMBRIDGE.

Philosophical Society, January 26.—Prof. G. H. Darwin, President, in the chair.—The following communications were made:—On the electric discharge through rarefied gases without electrodes, by Prof. J. J. Thomson. A vacuum tube was exhibited in which an electric discharge was induced by passing the discharge of Leyden jars through a thread of mercury contained in a glass tube coiled four times along it. The induced discharge was found to be confined to the part of the vacuum tube which was close to the primary discharge, and it did not show striæ. It was also demonstrated that an ordinary striated discharge is strikingly impeded by the presence of a strong field of magnetic force.—On diffraction at caustic surfaces, by Mr. J. Larmor. A caustic surface is physically a result of diffraction, and consists of a series of parallel bright sheets whose distances apart are always in the same proportion, and at different places are absolutely proportional to the cube root of the curvature of the sheets in the direction of the rays, for light of given wave-length. The general character of the appearances is illustrated entoptically when the light that has passed through a water-drop on a glass plate is received into the eye, so that the caustic surface intersects the retina in a caustic curve, usually cusped.—The effect of temperature on the conductivity of solutions of sulphuric acid, by Miss H. G. Klaassen (communicated by Prof. J. J. Thomson. The viscosity of sulphuric acid solutions reaches a maximum at a dilution corresponding to a hydrate, $H_2SO_4 . H_2O$. The electric resistance shows the same general characteristics. The resistance curves are plotted for different temperatures, and show that the effect diminishes with rise of temperature, and finally tends to evanescence, a result which would be accounted for by gradual dissociation of the hydrate.

PARIS.

Academy of Sciences, February 9.—M. Duchartre in the chair.—On Herr Wiener's experiment, by M. H. Poincaré. The author gave some mathematical objections to the theory proposed by M. Cornu to explain Herr Wiener's experiments on the direction of vibration in a beam of polarized light (*Comptes Rendus*, January 26).—Note by M. Berthelot, *à propos* of the preceding communication.—M. E. Becquerel submitted some of his photographic reproductions of the solar spectrum obtained more than forty years ago.—Determination of the masses of Mars and Jupiter by meridian observations of Vesta, by M. Gustave Leveau. The tabulated differences between observed and calculated places of Vesta show that the introduction of the secular perturbing influence of the asteroids does not sufficiently modify the residuals to take account of it in the formation of the tables of Vesta, but that the masses of Jupiter and Mars necessitate an appreciable correction.—On the conductivity of tribasic organic acids; a new characteristic of basicity, by M. Daniel Berthelot. It is shown that measurements of electrical conductivity furnish a new characteristic for the determination of the basicity of acids when their molecular weights are known.—On the combinations formed by ammonia with chlorides, by M. Joannis. Compounds of ammonia with chlorides of sodium, potassium, and barium, are described.—On the formation of isopurpurates, by M. Raoul Varet.—On the mode of combination of sulphuric acid in plastered wines, and on the detection of free sulphuric acid, by M. L. Magnier de la Source.—An olfactometer founded on the principle of diffusion across flexible membranes, by M. Charles Henry. The use of the instrument is to determine the weight of any odoriferous vapour per cubic centimetre of air, which corresponds to the minimum of perceptibility.—Action of certain substances used in medicine, and in particular of extract of valerian, on the destruction of glucose in the blood, by M. L. Butte.—On the manners and metamorphoses of *Emenadia flabellata*; facts relating to the biological history of Rhipiphori, by M. A. Chobaut.—On the development of the fins of *Cyclopterus lumpus*, by M. Fréderic Guitel.—A new fossil Cycad, by M. Stanislas Meunier.—On the coal basin of Boulonnais, by M. Gosselet.—On the presence of Upper Devonian in the Ossau valley (Lower Pyrenees), by M. J. Seunes.

CONTENTS.

PAGE
Reptilia and Batrachia of British India. By **O. Boettger** 361
Education in Alabama 362
Chemistry for Beginners. By **C. J.** 364

Our Book Shelf:—

Keltie: "Applied Geography 365
Hutchinson: "The Autobiography of the Earth."—**A. S. W.** 365
Perry: "Spinning Tops" 365
Emerson: "Wild Life on a Tidal Water" 366
"Arcana Fairfaxiana" 366
"Berge's Complete Natural History" 366

Letters to the Editor:—

The Bursting of a Pressure-Gauge.—**Newton and Co.** 366
Modern Views of Electricity.—**S. H. Burbury, F.R.S.; Prof. Oliver J. Lodge, F.R.S.; A. P. Chattock** 366
Pectination.—**H. R. Davies; E. B. Titchener** . . 367
On the Affinities of Hesperornis.—**Dr. F. Helm** . . 368
Destruction of Fish by Frost.—**Prof. T. G. Bonney, F.R.S.** 368
Babylonian Astronomy and Chronology 369
Temperature in the Glacial Epoch. By **Prof. T. G. Bonney, F.R.S.** 373
Surveying and Levelling Instruments. (*Illustrated.*) By **W.** 374
Professor Sophie Kovalevsky. By **P. K.** 375
Notes 376

Our Astronomical Column:—

Variability of the Andromeda Nebula 379
Eccentricities of Stellar Orbits 379
A New Nebula near Merope 379
Names of Asteroids 379
The British Mosses. I. By **the Right Hon. Lord Justice Fry, F.R.S.** 379
University and Educational Intelligence 382
Scientific Serials 382
Societies and Academies 382